

Leale (C. A.)

OBSERVATIONS
ON
THORACENTESIS.

Box 9.

BY

CHARLES A. LEALE, M. D.,

FELLOW OF THE NEW YORK ACADEMY OF MEDICINE, MEMBER OF THE NEW YORK
PATHOLOGICAL SOCIETY, AND OF THE MEDICO-LEGAL SOCIETY OF THE
CITY OF NEW YORK, ETC., ETC.

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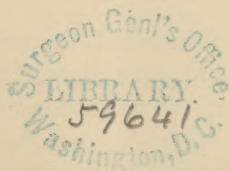
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OBSERVATIONS ON THORACENTESIS

(*THORACOCENTESIS—PARACENTESIS THORACIS*).

By CHARLES A. LEALE, M. D.,

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FROM the earliest history of surgery, we read of the operation of opening into the thorax for the removal of the products of disease; and yet there are patients permitted to die in this our advanced state of surgical knowledge, after having been bled, purged, and blistered, in vain attempts to produce absorption, rather than be saved by thoracentesis, which, as I will this evening endeavor to show by recorded cases occurring during the past eight years, not only rescues the patient from immediate death, but can also be the means of commencing a convalescence which may end in the restoration to perfect health.

Surely, in some instances, we might exclaim that, in the multiplicity of the new, many old and valued precepts are neglected.

The history, in brief, of thoracentesis, commences with Hippocrates and his followers, who, in purulent collections, used the knife, the caustic, and the hot iron, to open the chest and give exit to the pus.*

Ambroise Paré has the credit of having been the first to

* "Œuvres complètes d'Ambroise Paré," par J. F. Malgaigne, tome ii., Paris, 1840.

use the trocar and canula for the withdrawal of fluid from the thoracic cavity.*

In 1624, Gerome Goulou alleged that he succeeded more frequently in puncturing the chest for hydrothorax than when he performed abdominal paracentesis for ascites.†

In 1658, Bontius, for the first time, took up in a precise manner the subject of allowing air to be introduced into the chest.‡

In 1841, Prof. Skoda, and Prof. Schuh, of the Vienna School of Medicine, published an important work on this therapeutical subject.§

In 1844, Prof. Trousseau read a memoir before the Academy, on paracentesis thoracis.||

During the past twenty years, Dr. Henry I. Bowditch, of Boston, has operated on at least one hundred and fifty-four persons, making two hundred and fifty tappings—more times, perhaps, than any other man in this country.¶

In Dr. Bowditch's first case, the trocar and canula of Dr. Morrill Wyman were used, with a suction-pump attached, but since that time Dr. B. has devised an instrument, his modification of the trocar and canula, by which he thinks the operation is rendered less painful.

In January, 1865, Prof. Austin Flint, at his Bellevue Hospital clinique, removed over two pints of pus from the chest of an adult male, by a very simple apparatus devised by himself. It consisted of trocar and canula, about six inches in length, and corresponding in diameter to a No. 12 catheter (English measurement). To the end of the canula was attached one of Davidson's India-rubber syringes, which was manipulated and the quantity mentioned withdrawn while the patient was quietly sitting upright in a chair.**

* Lectures on Empyema, by Mr. Guthrie, London *Lancet*, June, 1853.

† Trousseau's "Clinical Medicine," vol. iii., English edition,

‡ Ibid.

§ Ibid.

|| Ibid.

¶ Bulletin of the N. Y. Academy of Medicine, vol. iv., No. 1.

** "Private Notes of Clinical Cases," by C. A. Leale.

In the spring of 1865, I operated by incising the intercostal space with scalpel, then introducing a No. 8 male silver catheter, to the end of which a Davidson's India-rubber syringe was fastened, and withdrew sixty-eight ounces of exceedingly offensive pus; closed wound hermetically; no more pus collected in chest; and, four years afterward, heard that the patient was enjoying good health. The history, in brief, is as follows:

CASE I. *Removal of Sixty-eight Ounces of Pus from Chest; Wound closed; Recovery of Patient.*—Captain N. B., One Hundred and Forty-second Pennsylvania Volunteers, aged twenty-eight years; wounded at Petersburg, April 1, 1865, by a conical ball, which entered one-fourth of an inch to the left of the ensiform cartilage; passed beneath ribs, through lung of right side, making its exit at the eighth rib on a line below the axillary space. Hæmoptysis followed, and lasted for several hours.

29th.—He was admitted to officers' ward, Armory Square Hospital, Washington. On physical examination, I found the two lower lobes of right lung collapsed, and partial solidification of the upper lobe. There was considerable febrile movement, he had become very much emaciated, and expectorated a very large quantity of the usual rusty sputa.

One ounce of champagne and one ounce beef-extract were given each alternate hour while awake, and the severe pleuritic pains were controlled by the hypodermic use of morphine.

May 6th.—While examining him, I easily produced the splashing sound, when shaking him suddenly. The line denoting the height at which the fluid came, while in the sitting posture, was about two inches above the right nipple. Not wishing then to operate, I left the ward, seeing him twice a day. The pus rapidly accumulated, and in two or three days I was hastily called to see him, the nurses stating that he was gasping for breath, and apparently dying. On arriving at the tent where he had been transferred, to get the benefit of fresh air, I found him sitting up in bed supported by two

nurses, gasping agonizingly for breath. Both wounds made by bullet had entirely healed.

I immediately made a valvular incision near the eighth rib; introduced a No. 8 male silver catheter, so that its extremity nearly reached the diaphragm (about four inches below the opening). To the free extremity of the catheter a Davidson's syringe was easily attached, when, by slow suction, sixty-eight ounces of thick, decomposing pus were withdrawn.

The stench of the liquid was so intolerable that long before the termination several of the attendants became faint and left. The catheter was now withdrawn, when the integument was firmly held over the valvular opening, and the wound hermetically sealed. The operation had not terminated fifteen minutes before he expressed great relief, and from that time he steadily improved in health.

26th.—Twenty days after the operation, before leaving for his home, I examined him, finding that he was rapidly regaining the use of his lung. He then easily walked a mile, and was apparently in a condition for a speedy and complete recovery. In answer to a letter from me, four years after being wounded, he stated that he was enjoying excellent health.

CASE II. *Traumatic Empyema, free Opening for Drainage of Pus; Death from Pneumonia of Opposite Lung.*—Captain J. N. H., Two Hundred and Tenth Pennsylvania Volunteers, aged twenty-two years. March 31st, at battle of South Side Railroad Station, received a penetrating gunshot wound of right thoracic wall. April 12th, came under my care; had collapse of right lung. At the time of injury he had slight hæmorrhage from wound only; I found that the ninth rib had been broken, that pus had accumulated in the chest, the wound having nearly closed. Several spiculæ of dead bone from the rib I removed, being sources of continued irritation; there was then very little liquid in the chest; soon, however, the wounds healed, and it was found that the liquid increased in the chest to such an extent that a bulging two inches below the wound appeared; this I opened by a free in-

cision, allowing a free exit. He commenced to improve, but pneumonia of opposite lung ensued, causing his death, May 5, 1865.

CASE III. *Perforating Gunshot-Wound of Lung, where considerable Air and Blood were hermetically sealed up in the Chest.*—This patient returned to duty in less than five weeks, and in nineteen months afterward was taken by me to the offices of Prof. F. H. Hamilton and Prof. Austin Flint, each giving him a careful examination.

Thomas Conaughton, private, Company F, Fifty-sixth New York National Guards, aged nineteen years, while in perfect health was accidentally shot by his comrade who was carelessly handling his Enfield rifle, while on duty at prisoners' camp, Elmira, at 10 o'clock P. M., August 13, 1864.

The ball entered half an inch to the right and below the nipple, passing through the right lung, making its exit at the margin of the posterior border of the inferior angle of right scapula; it then passed through the arm and chest of a friend, who, in consequence of paralysis, survived only a few days. The muzzle of the gun was within six inches of Conaughton's chest at the time of its discharge. The velocity of the ball was so great that, after having passed through the bodies of two men, it perforated a knapsack filled with clothing, and was lost. Conaughton soon became faint from loss of blood, which flowed freely from his mouth. He was immediately attended by the surgeon and assistant-surgeon of his regiment, who applied water-dressings; in half an hour whiskey was given, causing coughing to commence, and, at each severe effort, profuse hæmorrhage from the mouth. At 1 o'clock A. M., August 14th, three hours after the accident, he was brought to the United States Army General Hospital and placed in my charge. He had great dyspnœa and several attacks of syncope, blood and air being drawn in and expelled from wound during his violent efforts to cough.

I immediately removed the dressings which had become misplaced, and, on examining the wounds, found that the edge of the rib at point of entrance of ball had been denuded of

its periosteum, but not broken; as soon as the dressings were removed, quite a quantity of air entered the chest through the wound with a shrill, hissing sound, causing a return of the dyspnœa and syncope; he ceased breathing for a moment, and at each effort to inspire increased the admission of air into the chest. In an instant I slid the integument over the opening for at least an inch, thereby closing wound completely; his breathing now was regularly established, but soon violent paroxysms of coughing followed, when simultaneously air and blood were with great force expelled from the anterior wound. I then performed Dr. B. Howard's operation of hermetically sealing, first by removing the uneven edges, uniting by silk sutures, then covering all with court-plaster, and six or eight coats of collodion, and over all a moderately firm bandage was applied; 3 ss tr. opii was given, and in less than an hour he was asleep in the semi-recumbent posture in bed. At 8 o'clock A. M. I saw him, and found that he had passed a very comfortable night; he had considerable febrile movement and commencing pneumonitis; the cough continued, and for four or five days he raised at least eight ounces of frothy, bloody sputa; at times the blood came away in mouthfuls, and was of a bright, arterial color, occasionally containing coagula. The dressings dropped off in three days, the anterior wound having entirely healed, and at the posterior wound there were two or three drops of pus from the integumentary surface only; the pneumonia lasted for two weeks, and, in less than five weeks from the time of being wounded, he was returned to duty in his regiment. Being now ordered to a different station, I lost sight of him until the following February, when I was requested to examine him, while he was reënlisting, finding him in excellent health. On the 19th of March, 1866, over a year and seven months from the time of reception of wound, I presented him at the office of Prof. F. H. Hamilton, where both Dr. Hamilton and Dr. Elisha Harris examined him: externally nothing could be seen except cicatrices and marks of the sutures; at the request of Prof. Hamilton, Prof. Austin Flint gave him a thorough physical ex-

amination, and found slight dullness, confined to a space about four inches in circumference, due to pleuritic adhesions; otherwise that lobe was perfectly healthy, as were the remaining lobes of both lungs. His general health was perfect.

CASE IV. *Traumatic Empyema; Free Opening for Discharge of Pus; Death from Exhaustion.*—Colonel C. R. P., Sixth Maryland Volunteers, aged thirty years, gunshot-wound of left thorax, ball entering at ensiform cartilage of sternum, passed anterior to mediastinum, fractures the sixth rib, passing between the pleuro-costalis and pleuro-pulmonalis, making its exit three inches below the nipple.

May 14th, I found that the fractured extremities of ribs were undergoing necrosis; he had frequent attacks of dyspnoea, and occasionally syncope. Morphine was given hypodermically to relieve pain. He had champagne, and the best diet carefully given. The necrosis soon caused several roughened edges on the ribs, immediately covering the heart, and being fearful of perforation of the pericardium, which could easily be seen, immediate consultation was called, and Surgeon Basil Norris, U. S. Army, skillfully removed all dead bone, the patient being profoundly anæsthetized by chloroform for over fifteen minutes. As he depended wholly on respiration by opposite lung only, the anæsthetic was more slowly given than usual, and after the termination of the operation his return to consciousness and regular breathing was very slowly accomplished. The patient rallied well, and by the operation a free outlet of pus was made. The discharge now became exceedingly offensive; this was controlled by the assiduous care and skill of Dr. C. B. Porter, who washed out the cavity with a diluted solution of the chlorinate of soda. The patient slowly gained strength, even during the very hot months of July and August, and, contrary to advice, left Washington in a drawing-room car. The journey caused such exhaustion that he died a few hours after arriving at his brother's home in Brooklyn.

CASE V. *Traumatic Empyema; Pus discharged by a Free Incision; Recovery.*—Colonel B. F. S., Tenth New York Cavalry, aged twenty-nine years. At the battle of Din-

widdie Court-House, March 31, 1865, received a perforating gunshot-wound of left thorax. On (or near) April 12th, came under my charge. The wound of entrance was six inches below the left nipple; the wound of exit near the spine, at eleventh rib. The wounds had closed spontaneously, although the tenth rib had been fractured, pus rapidly accumulated in chest. I made an incision three inches in length, removed several portions of necrosed bone from fractured rib, giving exit to about a pint of offensive pus; then washed out cavity with diluted liquor soda chlorinate.

Patient has valvular insufficiency, with hypertrophy of heart, which he stated had troubled him for several years.

May 4th.—There was a fistulous opening, through which a small quantity of pus each day was discharged (about 3 ij). He still had occasional attacks of dyspnoea, but was well able to return to his home by rail.

CASE VI. *Traumatic Empyema; Free Opening for Continued Discharge of Pus; Bullet remained in Lung; Recovery.*—Colonel A. B. F., Sixteenth Maine Volunteers, aged twenty-five years, gunshot-wound of left lung at battle of Five Forks, April 1, 1865. The ball entered between fifth and sixth ribs lateral aspect of chest; remaining in parenchyma of lung.

May 7th.—Admitted to my care; found empyema and pneumonia. At his request, I enlarged the opening, and carefully used the Nélaton probe, which came in contact with a hard substance, after being introduced four inches, but, as not the slightest stain could be detected on its withdrawal, it was supposed that the ball might have become encysted; and, as on previous examinations he had had two severe attacks of hæmoptysis, it was deemed advisable to let it remain. He gained strength rapidly, and June, 1865, returned home, pus still discharging through a fistulous opening.

August, 1866.—In answer to a letter from me, he stated that the ball was in his lung, that the opening had long since closed, and that he had moderate good health.

The following case shows how the pleura may be pushed

considerably from the normal position, as has been sometimes noticed when empyema has been operated for by means of the trocar :

CASE VII.—General B. W., aged thirty-three years; wounded at Petersburg, April 2, 1865. The ball entered at tenth rib, right side, passing beneath ribs without perforating the pleura, making its exit one inch to the left of first lumbar vertebra, after having passed between the spinous processes. The wound suppurated along its entire course; the sloughing tissue in about a week was entirely removed by a seton of oakum, after which pressure soon caused wound to heal. May 4th, returned home in good health.

CASE VIII. *Traumatic Empyema where a Free Incision was made for Exit of Pus; Death and Autopsy.*—Captain P. D., Two Hundred and Eighth Pennsylvania Volunteers, aged twenty-six years; wounded at Petersburg, April, 1865; came under my care April 24, 1865. He was wounded while on horseback, during a retreat, by a conical ball, which entered beneath the inferior angle of the left scapula, passing through the left lung, making its exit at the apex of the clavicular border of the deltoid muscle of left arm.

He told me that, at the time of being wounded, he was leaning forward on his horse as much as possible, holding the reins in his left hand, and fleeing from the enemy. When I first saw him, he had great dyspnœa, and very severe pleuritic pains, which were terribly increased by a violent cough. The wound of entrance had healed, wound in arm suppurating, considerable pus had collected in his chest, and during a severe expiration a gurgling sound was produced by air being forced through pus from bronchi in thoracic cavity. The sound produced was so loud that it could be easily heard a distance of thirty feet, and several times, during very severe attacks of coughing, the air and pus would be thrown through wound near shoulder.

May 9th.—By a free incision I reopened and enlarged the wound of entrance, and twelve ounces of pus escaped. The opening was kept free, and the chest, which was very offensive,

carefully washed out daily, by a dilute solution of the chlorinate of soda. To control pain, it was found necessary to give as much as one grain morphine, hypodermically, at each dose. Every thing that he called for, in the way of nutritious diet, was given him, and also eight ounces of champagne daily.

He soon commenced to improve, the cough diminished, the opposite lung easily performing the necessary respiratory function, and he was congratulated on his prospect of a speedy return home, which, however, unfortunately never came, for on the 2d June I was hurriedly called to see him, and found that during a violent paroxysm of coughing he threw up his arms, and, before his attendant reached him, expired.

At the necropsy, I found the chest nearly filled with blood, which had come from a slough in the axillary vein in course of wound.

CASE IX. *Empyema*.—Boy, aged twelve years; chest opened by incision, and pus allowed to flow out; made a good recovery; opening closed in six weeks.

CASE X. *Empyema*.—Boy, two years old; chest opened by incision; eighteen ounces withdrawn; wound healed in four weeks; complete recovery.

CASE XI. *Empyema*.—Girl, nineteen months old; chest opened by incision. This child was first brought to my class for diseases of children, at the Northwestern Dispensary, February 14, 1870, her mother saying that she had been in poor health for two months; that the little one cried from pain whenever her chest was compressed while being lifted. On examination, there was dullness over entire right lung; the left lung was in good condition. On the following day I made an incision between the seventh and eighth ribs, introduced the silver catheter, and, with a Davidson's India-rubber syringe, removed sixteen ounces of thick pus. During the operation the pain was very slight, and after the removal of the pus she felt much better. The wound, which was valvular, was easily closed by three fine silk sutures, then covered by a piece of court-plaster. On visiting her forty-eight hours afterward, the plaster was found to have dropped off. The stitches were removed. Wound entirely healed.

September, 1870.—She was brought to my office, her mother saying that during the past summer she had had several severe attacks of diarrhoea, from which she recovered. The child then was in excellent condition, and on examining the right lung all the lobes were resonant, performing the necessary respiratory function, there being no reason to doubt her entire recovery.

Fourteen months after the operation of thoracentesis the child died of acute enteritis.

Necropsy, assisted by Dr. Harwood, on the following day. Body well nourished. As there had been no noticeable abnormal condition except the inflammation of the bowels, the abdominal and thoracic cavities only were examined. No peritonitis; the mucous membrane of the bowels presented the appearances of recent acute inflammation and cause of death. The left thorax and contents were normal. On removing the right lung it was found to be adherent, at several points, by pleuritic bands at the superior and posterior border; it was inflated. Over its surface were visible several small deposits of fibrinated lymph. All the lobes were inflatable. On cutting into the parenchyma, the only abnormal conditions existing were four or five portions, about the size of small nutmegs, of simply compressed lung. There were no cheesy or tubercular deposits found in any part of the body.

CASE XII. *Thoracentesis, and Removal of Eighteen Ounces of Pus, for the Relief of Empyema in a Boy Twenty-two Months old; the Wound was left open, and a Year afterward Pus was still discharging through a Fistulous Opening.*—M. M., grandchild of a New York physician—parents predisposed to pulmonary trouble. The child was in good health until the early part of November, 1869, when, after a severe chill, pleurisy, with effusion, developed. December 5th, I was hurriedly called to see him for the first time, and found him sitting in his mother's lap, with cyanotic countenance, rapidly breathing, and his body bathed in a cold, clammy perspiration. The accumulation of liquid in the the thorax was so great as to cause com-

plete relaxation at the sterno-clavicular articulation. The pressure from within was so much that the usual depressions at the intercostal spaces were lost, and the entire affected side presented a strikingly bulging rotundity. The suffocation was so near that he would lose his breath, and with difficulty return to regular breathing again. I was afraid that he would die before I could open the chest. This, however, was immediately done at the eighth rib, on a line below the angle of the scapula, when eighteen ounces of very thick pus escaped. As soon as the pressure had been removed, the little child experienced such relief that regular breathing was soon established, and he fell asleep. The wound was dressed daily, with a pad of oakum, moistened with water, which permitted a continuous drainage. In a month, the discharge was hardly perceptible, and I endeavored to close the fistulous opening by stimulating its edges with nitrate of silver, but this proved of no avail. One year after I had operated, I examined the child, and found that the fistulous opening still existed, but that it had closed several times during the interval; that each time it closed the child would cough, and have considerable febrile movement, all of which left as soon as a free exit of pus was established.

The child's general condition was not good. The lungs were the seat of a low grade of chronic inflammation. The distal phalanges of all fingers and toes were twice their normal size, the extremities presenting the appearance of greatly impeded pulmonary circulation, being cold and blue, with veins continually distended.

The child was taken to the country, and has not since been heard from.

CASE XIII. *Great Relief from Pain, and Prolongation of Life, following the Removal of Sixty Ounces of Pus from the Chest of an Adult having Phthisis.*—Miss Annie F., aged twenty-one years, had phthisis pulmonalis, and in consequence had not menstruated for two years.

On June 23, 1868, I was hastily summoned, for the first time, and found her supported by friends in the sitting pos-

ture, in bed, gasping for breath, bathed in cold perspiration, and suffering from intense, lancinating, pleuritic pain.

On examining the chest, I found complete dullness over entire surface of the left lung, and was easily convinced that there was a large collection of pus in the thoracic cavity; this, with the impaired use of the opposite lung, caused her to be in the greatest misery, and apparently dying in great agony.

By a very small, and almost painless incision with the scalpel, I opened the chest on its lateral aspect, at the seventh rib, introduced through the opening a No. 8 male silver catheter, at the end of which a Davidson syringe was attached, when sixty ounces of offensive, thick pus were slowly withdrawn. During the suction, especially when about a quart had been removed, she experienced such relief that she thanked me for having operated, but, as the operation proceeded, she had occasional lancinating pains, and slight attacks of syncope, which were easily relieved, by giving half an ounce of brandy, and discontinuing the suction for a moment. At the termination of the operation, she was so much relieved, that she could respire quite freely, as long as no air was permitted to enter by the wound. Two or three times during the operation, and on the withdrawal of the catheter, a small quantity of air passed in, producing such dyspnoea as to prove conclusively that she could not tolerate a free incision, for the free admittance and exit of air.

The wound was, therefore, hermetically closed, and in three days had entirely healed.

She regained her strength so rapidly that in one week I found, on visiting the house, that she had gone to Central Park (which was just opposite), and for the several succeeding days following took a short walk in the garden. She continued to recuperate until July, when the weather became intensely hot and she again gradually lost strength, until July 12th, when she died an easy death, by exhaustion. No autopsy was permitted.

She was apparently dying when I first saw her, while suf-

fering intense pain, and there is little doubt but that the removal of nearly half a gallon of pus relieved pressure on her right lung, prolonged life, gave great ease, allowing her, when she finally became exhausted, to die comparatively free from pain.

CASE XIV. *Spontaneous Cure of Empyema, by Discharge per Bronchi.*—Niemeyer states that “a penetration of the empyema into the lungs, and its discharge by way of the bronchi, sometimes happen,” but that a recovery in such instances is rare. In my notes I have the account of one such, where as much as thirty ounces was ejected in a single day, yet in sixteen months afterward the patient was in good health. The history in brief is as follows :

Captain T. A. H., Ninety-first Pennsylvania Veteran Volunteers, aged twenty-six years. Penetrating gunshot-wound of lung; ball entered three inches above the nipple, right side, and lodged in the parenchyma of the lung; he had considerable hæmoptysis shortly after reception of wound. April 29, 1865, he was admitted to my ward; the wound had entirely healed; he had extensive empyema. About the middle of May following, during a violent paroxysm of coughing, he was nearly strangled by a large quantity of pus, which ran from his mouth. Knowing that it must have come through the bronchial tubes, I requested the nurse to save all that came away in the following twenty-four hours, and found it measured thirty ounces. His attacks of pleurodynia were relieved by morphine. In less than a week after the discharge of pus by mouth he commenced to improve, and so continued until he left Washington. I heard from him a year and four months afterward, when he stated that he was entirely well, and an active business-man in Philadelphia.

Dr. George A. Otis, U. S. Army, in his review of the operation of thoracentesis, as practised during the war, states that the point of election for the first puncture, though in a measure determined by the seat of the injury and the nature of the effusion, appears to have been the seventh intercostal space, one-third of the distance from the spinous processes of

the vertebra to the median line of the sternum. This point was selected in nine of seventeen cases in which this particular is noted. In five the puncture was made between the eighth and ninth ribs, and once in the fourth, once in the fifth, and once in the tenth intercostal space. The ordinary trocar, furnished in the field operating-cases, was usually employed; but in a few instances the methods and apparatus recommended by Drs. Wyman and Bowditch, and by Dr. Flint, were employed.*

In a bibliographical notice of the St. Thomas's Hospital Reports,† Dr. G. H. Evans presents tables clearly showing the advantage of performing the operation early in the disease. Thus, out of a total of 533 cases, 373 recovered, 153 died, and in 7 the result was doubtful; this makes the rate of mortality 29 per cent. But out of a total of 308 cases, in which the effused fluid was serum, 74 died, making the rate of mortality 24 to 26 per cent. In 24 cases of serous effusion, in which the operation was performed not later than the end of the fourth week, 21 recovered, and 3 died; in one of the three fatal cases there was disease of the liver, and in the other two the operation was performed as a last resource, merely with the view of prolonging life. In 17 cases where the operation was performed after the first month, but not after the second, 13 recovered and 4 died; one of these latter died two years afterward, of phthisis. In 10 cases where it was after the second month, but not after the fourth, 5 recovered, and 5 died. In 8 cases, where the effusion was more than of four months' duration, 3 recovered, and 5 died.

In a report on "Scandinavian Medicine," by Dr. J. W. Moore,‡ a monograph by Dr. L. F. Toft, of Copenhagen, noticed, in which he deals with thirty-seven instances of spon-

* "The Medical and Surgical History of the War of the Rebellion," part i., vol. ii. Surgical History, prepared under the direction of Joseph K. Barnes, Surgeon-General U. S. Army, by George A. Otis, Assistant-Surgeon U. S. Army.

† *American Journal of Medical Sciences*, October, 1872.

‡ *Medico-Chirurgical Review*, July, 1872.

taneous primary empyema, which term he applies to those cases where from the first a pus exudation is the consequence of inflammatory action. In addition, fifty-one cases are referred to, in which the original purulent nature of the exudation could not with certainty be ascertained. In both classes the proportion of male subjects of the disease was double that of women similarly affected.

Of the 37 examples of primary empyema, 25 occurred in men, and only 12 in women; of the 51 cases of empyema, in which absolute purulent origin was not a necessary factor, 36 occurred in men, and but 15 in women. The disease was most frequently met with between the ages of twenty and forty years. The effect of season was clearly shown by the statistics of all the cases; the greatest number of patients being affected during the winter months, and again in April, when the changes of temperature were excessive, and there was greater exposure from renewed work in the open air.

As regards the seat of the effusion, it was double in four of the whole eighty-eight cases, on the right side in forty-seven, and on the left side in thirty-seven instances, the respective percentage being 4.6, 53.4, 42.0.

In his analysis of the physical signs of empyema, Dr. Toft remarks: "Metallic tinkling appears to arise in two different ways, both of which are dependent on the presence of air in the pleural cavity. Either a bubble of air presses out from the opening into the lung, and bursts in the pleura, or a drop falls from its roof down into the fluid below. The second mode requires more room, and less fluid than the first, the bursting of an air-bubble is caused by or follows a respiratory effort, while the fall of a drop depends on the movements of the body."

In an article on thoracentesis by suction, in empyema and hydro-pneumothorax, by Dr. Bouchut,* after mentioning the old "Galenic plan of simply opening up the cavity of the chest by an incision in the intercostal space, and the modification, in which a Chassaignac's drainage-tube was introduced, he

* *Medico-Chirurgical Review*, July, 1872.

proceeded to describe his own plan, which consists of frequently-repeated aspirations, with Dieulafoy's pneumatic aspirator, often repeated two or three times in the week. He believes this method to be far superior to any other, but points out that, if the lining is bound down by adhesion, it will not expand to take the place of the fluid removed, and that then it may be necessary to make a counter-opening, and introduce a drainage-tube. This method, however, evidently involves a protracted treatment, for in the three cases brought forward by the author, as illustrative of the advantages of his method, one was still under treatment after nine months' continuous operation; another was discharged cured, after six months' treatment and thirty-nine operations; while the third case ended fatally."—*Gazette des Hôp.*, January, 1872.

In a paper on thoracentesis, in the *English Practitioner* for August, 1872, Dr. Clifford Allbutt states that, during the past three years, he has advised thoracentesis in fourteen cases, and with but one doubtful result. In many cases, as much as one hundred or one hundred and twenty ounces were drawn off. Indeed, the doubtful case, he states, was doubtful only in appearance, and, so far as the operation was concerned, it may justly be reckoned among the successful ones. Dr. Allbutt cites a remarkable instance, which he saw in consultation with Mr. Smith, of Halifax, and Mr. Joseph Teale, of Leeds, where the effusion was not only bilateral, but there also existed an effusion into the pericardium. The patient was suffering from acute rheumatism, and had effusion into two-thirds of the left pleural cavity, one-third of the right cavity, and into the pericardium. Death was imminent. They first determined to tap either the left pleura or the pericardium, but finally decided upon the left pleura. Mr. Smith drew off some twenty ounces of highly-fibrinous exudate, with the result of setting up rapid absorption, not only in this cavity, but the other two cavities also, and, as he says, had the unmistakable satisfaction of snatching a fellow-creature from the edge of the grave. Dr. Allbutt adds that, owing probably to the mischance of a small adhesion, the lung was pricked in this

case; air welled quickly forth, and the dyspnœa was aggravated for a few minutes to a desperate point; but, as this danger passed off, no other ill consequences appeared. He also stated that in highly-inflammatory cases, such as acute rheumatism, there does not seem to be much risk in turning the fluid into pus; but in the sub-inflammatory, cachectic, and latent forms, in which also tapping is more often required, the tendency to pyoid conditions being stronger, we are more apt to have a tapping for serous effusion followed by empyema.

In a letter from Dr. Henry I. Bowditch to Dr. Clifford Allbutt, published in the *Practitioner*, of November, 1872, with reference to the proper size of trocars, he states that an American "exploring" trocar, simply made thick enough to safely thrust between the ribs, is what he has used ever since he first operated in this way, as suggested by his friend Dr. Wyman; also that an "exploring trocar" and suction-pump are essential points of Dr. Wyman's idea, and hopes thoracentesis (i. e., when used freely) will be always performed with such a trocar, unless in some cases where pus already exists, when he believes we must make long incisions between the ribs, and not trust to large trocars, or drainage-tubes, etc.

In a note Dr. Allbutt states that in England almost any exhausting trocar and canula, with an apparatus to prevent the ingress of air, gets, rightly or wrongly, the name of "Bowditch trocar;" often, no doubt, wrongly. These vary very much in size, and are often, no doubt, made as small as those used by Dr. Bowditch himself. But they are often much larger, and, he thinks, with the hope of preventing occlusion. He writes that he cannot be sorry to have drawn forth so valuable an expression of opinion from Dr. Bowditch, who is, he states, perhaps the first living authority on the subject.

In a paper read before the Obstetrical Society of London, by Dr. Playfair, on the "Treatment of Empyema in Children,"* the author described peculiarities of pleurisy in children, as contradistinguished from the same disease in the

* London *Lancet*, January 27, 1872.

adult. He then referred to the change of opinion which had of late years been observed with regard to the operation of paracentesis. This operation, he says, in ordinary serous pleurisy, evidently stood on a very different footing from the same operation in empyema. In former years we only sought to relieve the distention by removing some of the fluid, and allowing the remainder to be more readily absorbed, while in the latter the chance for absorption was diminished to a minimum; and it would be a great gain if we could effect continuous drainage of the pleural cavity, and at the same time effectually exclude the entrance of air.

The author then described the method of drainage by Chassaignac's tube, with illustrative cases. He also described the method of cutaneous subaqueous drainage advocated by himself, and related the history of three cases successfully treated by it—"the results," he states, "being very satisfactory, and contrasted remarkably with the cases treated by pneumatic aspiration by Bouchut." The paper was illustrated by drawings of the chests of five children, taken by Dr. Gee's cystometer.

Dr. HILTON FAGGE felt bound to mention to the Society that he had recently had a case in which the same method had been employed, and with results not entirely so satisfactory. The pus had, in this instance, made its way by the side of the India-rubber tube, and continued to discharge. It was of great importance that the tube should be tightly grasped by the skin, and for this reason it was better to remove the canula before introducing the India-rubber tube, which should be of the same diameter.

Dr. F. T. TAYLOR mentioned a case treated in a similar manner.* The chest was tapped with a siphon-trocar. An India-rubber tube was affixed to the canula, and carried into a basin of water. The canula and the tube were retained twenty-four hours, and then a piece of elastic catheter, with a smaller India-rubber tube, was inserted through the canula,

* London *Lancet*, January 27, 1872.

which was withdrawn. The tube was retained for fifteen days.

Dr. SEDWICK* had, during the last fifteen or sixteen years, carried out the same principle by using a canula, the tube of which projected externally and much beyond the shield, on which he slipped a long India-rubber tube with the other end dipping into a dish of water. The plan of introducing the India-rubber tube into the chest, he thought, was much better than leaving the canula in. Dr. Sedwick had adopted the same plan in a case of paracentesis abdominalis, where the patient was very weak, and the abdominal walls were almost as thin as parchment. The rapidity of the flow was entirely under control by means of pressure on the tube.

In the St. George's Hospital Reports, vol. v., 1870,† Dr. H. W. Fuller states that his advice, founded on large bedside experience, may be summarized thus: 1. Tap whenever dyspnoea is very urgent, or as soon as it becomes evident that remedies fail to produce absorption of the fluid in the chest; 2. Tap as low down as possible, and make a free opening, allowing the chest to empty itself thoroughly; 3. So far as possible, avoid causing any local irritation; 4. If the fluid withdrawn is serous or sero-sanguineous, close the opening with carbolic plaster as soon as the operation is concluded: if, on the contrary, the fluid is purulent, adopt some means to prevent the wound from closing, and take care that the matter is allowed to drain off as fast as it is formed; 5. After the operation, support the patient by bark and good nourishment, and for a day or two give him opium if necessary.

POINT OF ELECTION FOR PERFORMING THE OPERATION OF THORACENTESIS.

When the opening is to be closed, the lateral aspect of the chest between the seventh and eighth ribs appears to be the most favorable point; I admit that this is not the most dependent portion, but with the instrument used, such as every

* London *Lancet*, January 27, 1872.

† "Braithwaite's Retrospect," January, 1872.

surgeon has, viz., a catheter, with fenestræ only near the extremity, its point may be passed down near the diaphragm, then the chest can easily be emptied of its liquid contents.*

When a free incision is to be made and allowed to remain open, and where the most dependent part is desired, we might accept the results of the experiments of Freteau, of Nantes, who has done much to settle this question. He says that he performed the operation on the right side between the ninth and tenth ribs, and on the left side between the tenth and eleventh ribs, in more than thirty bodies, and always opened into the thoracic cavity, commencing the incision close to the edge of the latissimus-dorsi muscle, or about three inches and a half from the spine; an operation in this place, Mr. Guthrie states, "should always be performed by incision, and not by trocar."†

Mothers have told me that the first symptom noticed was, the great pain caused when the child would be raised, by placing hands under the arms, necessarily compressing the affected part. Patients with considerable liquid in chest prefer the semi-recumbent position while sleeping. The heart, as a rule, occupies an abnormal position, and the head is usually held leaning toward the affected side, to facilitate passage of air through healthy bronchus. Abscesses may form, whereby an exit of the pus may take place, but I think that death by suffocation, as a rule, ensues if no outlet by art is made.

There is dullness on percussion, corresponding with the level of fluid contained in the chest; when partially filled this is changed to compare with the height of the fluid in its different positions: in a child two years of age, having about ten ounces of liquid in the chest, there would be complete dullness on percussion up to nipple while in the sitting posture, and over the same space resonance anteriorly while lying down on back; and it is by this method that we are enabled to diagnose the quantity of fluid before an operation has been de-

* See "Comments on Remarks," by Dr. Leale, in Transactions of New York Academy of Medicine, vol. iv., No. 1.

† Mr. Guthrie's "Lecture on Empyema" (London *Lancet*).

cided on. In the case of N. B., where air and pus mingled freely, the splashing sound was easily produced by shaking the patient.

The circumference of the chest is perceptibly increased, especially in children—the exact difference can easily be noted by taking the middle of the sternum and spinous processes as guides, passing directly over the nipple, where, as a rule, the bulging is more marked; of course care should be taken to get measurement of normal side, both before and after inspiration. The accumulation may be to such an extent as to disarticulate the clavicle, as in M. II. The affected side during the respiratory act is almost if not altogether motionless, while there is increased expansion on the well side, and severe pain during inspiration is a frequently-occurring symptom.

Method of operating, after having been satisfied by an Exploring Operation done painlessly by Ether-spray.—A half-inch incision is made by firmly holding a sharp scalpel and directly cutting down upon the eighth rib to the bone, then drawing up the integument, still holding the knife *in situ* until the incision covers the space between the seventh and eighth ribs, beneath angle of scapula, when it is pushed forward (which in nearly every instance would be less than half an inch), when it enters the thoracic cavity. The opening is sufficiently enlarged to admit the point of a No. 8 male silver catheter, which may be gently pushed downward until it is near the diaphragm; the chest may be easily emptied of any fluid by gentle and continuous suction, as before noticed in the case operated on by Prof. Flint, in 1865. Sometimes, during the withdrawal of the fluid, slight attacks of syncope and occasional dyspnoea occur, but they usually are of short duration, and generally cease if the suction is discontinued for a few moments. After the liquid has been withdrawn, the catheter may be slowly removed, and as its edge is freed the integument can be easily slid back to its original position, directly over the eighth rib. This opening, which is now valvular in character, should, if desired to be closed, have its edges held in apposition by means of two sutures, the surface

then dried and covered by small strips of adhesive plaster, and over the whole a moderately firm roller applied, which will prevent emphysema of the surrounding cellular tissue. As a rule, the wound will be entirely healed at the end of twenty-four hours, when the stitches should be removed, and, for additional safety, the compress kept applied for three or four days.

But if the wound is desired to be left open, then an incision at least two inches in length should be made, to permit of free drainage.

During the operation we can decide whether the opening should be closed or left open: I do not think that this should be decided by adopting the general rule, viz., where there is pus, leave a free exit, and where there is serum close the opening, but, from past experience, should say when the pus is what the older surgeons termed laudable, and especially when, by its density, etc., we suppose that it has commenced to undergo the usual change preparatory to absorption, then I think that recovery will be much hastened by closing the wound, and allowing what remains of pus or air to be absorbed, as noted in several of the cases before cited.

But if the fluid have any offensive smell, then not only should a free opening be allowed to remain, but the chest should be thoroughly washed out occasionally with the solution so successfully used by Prof. Peaslee after ovariectomy, viz., a mild solution of chloride of sodium and carbolic acid. This, however, should be discontinued as soon as practicable, when the wound can easily be closed, which causes far less debility, and a more speedy restoration of the lung to its appropriate condition. There are yet physicians who contend that it is better to allow the fluid to remain in the thorax than resort to any surgical interference. In answer to such, I can say that the danger is not only that by continuance of the constantly-increasing exhaustion, but death sometimes happens suddenly, when least expected, as occurred to the brother of a governor of a neighboring State, who, while in Albany, retired in ordinary health, and was found dead in

his bed on the following morning, the pus having suddenly perforated the bronchi, and, before assistance arrived, life was extinct.

With reference to the admission of atmospheric air into the chest, I am also convinced by experience that this always follows to a certain extent where a large quantity of fluid is withdrawn. But then it has been proved that air, blood, and pus, can be hermetically sealed up in the chest, and be absorbed. In the case of Conaughton, there was a large quantity of air and blood closed up in the chest, yet in a very short time all had disappeared. Also in the instance of Captain N. B., atmospheric air, blood, and pus, were confined in the chest, and, as recorded, disappeared, and four years afterward he was in excellent health. Mr. Guthrie mentions a case where the admission of air was so great that, to relieve distressing symptoms, it was removed by a syringe.*

"Why should the trocar be retained for thoracentesis, any more than for tracheotomy?" asks Trousseau.

In 1586, Sanctorius, who seems to have been the first to practise bronchotomy, proposed puncture of the trachea with the trocar, which he had invented for abdominal paracentesis.† If we wish either to avoid injury to other organs by puncture, or the admission of air into the cavity, we think the scalpel possesses advantages over any instrument which is forcibly thrust sometimes into vital organs, which would not be the case when we see tissue by tissue through which we cut.

Dr. Watson relates a case seen by him, where death was caused by using the trocar: he states that the integuments of the side were œdematous; and it was thought that a little serum issued upon the passage of the grooved needle. The serum must have come from the infiltrated areolar tissue. No liquid was evacuated by the trocar. The patient died a day or two afterward, of peritonitis. The instrument had perforated the diaphragm, and entered the spleen, which was unusually large.‡

* Guthrie on Empyema (London *Lancet*).

† Trousseau, "Clinical Medicine," vol. ii., English translation.

‡ Watson's "Practice of Medicine," London, 1857, p. 141.

The skillful Laennec also had an unfavorable case, resulting from the use of the trocar, where the operation was performed at his favorite seat, viz., between the fifth and sixth ribs; he thrust the instrument, as he supposed, into the thorax, and was a good deal surprised to find that no gush of liquid followed its introduction. The patient died, and dissection showed that the trocar had entered the cavity of the abdomen after transfixing the diaphragm, which, having been forced upward by a large liver, had contracted firm adhesions to the seventh rib.*

Finally, I think that I can safely say, after carefully considering the subsequent histories of all the patients on whom I have performed thoracentesis during the past eight years, that in every instance it has proved successful, either by not only preventing death, preceded by the most agonizing symptoms that a physician is called upon to witness, but in the majority of instances we may confidently hope a restoration to at least very good health.

I should, as in tracheotomy and abdominal paracentesis, prefer to use the scalpel to open the chest: 1. As a safer procedure; 2. An incised wound is known to heal (if required) with greater certainty; 3. That, by using a long male silver catheter, the most dependent part of the chest can be emptied of its fluid contents, and there is no danger of pricking the lung from change of position or movement of patient while the liquid is being withdrawn, as noted by Dr. Allbutt.

4. That when pus has commenced to undergo that change preparatory to absorption, the probabilities are, that very little, if any, will be reproduced after the operation, if the wound is immediately closed.

5. That, in closing the wound under the above circumstances, the little atmospheric air admitted, and the small quantity of pus left behind, are very soon absorbed.

6. That if pus should again accumulate in the chest, the operation is so easy, the pain so slight, and the closure so rapidly accomplished, that a repetition is nothing to be feared,

* Watson's "Practice of Medicine," London, 1857, p. 141.

and really causes less prostration than where a large incision is made, and possibly pus formed with greater rapidity.

7. That atmospheric air, pus, and blood, even to the extent of about eight ounces, may be absorbed, and that the injured compressed lung can again resume its normal condition, as so conclusively proved by the recorded *post-mortem* examination.

8. That, when unhealthy decomposition has commenced, the wounds should be left open, and the parts carefully disinfected.

9. That thoracentesis should oftener be performed for the quick removal of fluid from the chest, even as recorded during far advanced phthisis pulmonalis, when relief may be obtained, life prolonged, and painful death averted.

